

REMARKS

This is intended as a full and complete response to the Office Action dated June 8, 2005, having a shortened statutory period for response set to expire on September 8, 2005. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1-11, 13-15, 17-28 and 30-36 remain pending in the application upon entry of this response. Claims 12, 16 and 29 have been cancelled by the Applicant. Claims 34-36 have been added by the Applicant. Claims 1-11, 13-15 and 17-33 stand rejected by the Examiner. Reconsideration of the rejected claims is requested for reasons presented below.

Claims 2-4, 6, 14-15, 18, 21, 24 and 27-28 stand objected to because of informalities and Claims 21-22, 25 and 32-33 stand rejected under 35 USC § 112 as being indefinite for failing to particularly point out the claimed subject matter. Claims 2-4, 6, 14-15, 18, 21-22, 24-25, 27-28 and 32-33 have been amended to correct any informalities and indefiniteness stated by the Examiner. Withdrawal of the rejection is respectfully requested.

Claims 1-7, 11, 13-15, 17-19, 23-28 and 30 stand rejected under 35 USC § 102(e) in view of Miura, et al., US 2003-0155247 (herein *Miura*), on grounds that the claims are anticipated by *Miura*. The Applicant submits that the current amended claims do not anticipate *Miura*.

Miura discloses processes and solutions for an electrolytic copper plating process. The electrolytic copper plating solution contains a copper salt (*e.g.*, copper sulfate or copper chloride) and a complexing agent and has a preferred pH of 7 to 10. *Miura*, alone or in combination, does not teach, show or suggest a method for depositing a copper seed layer onto a substrate surface containing a barrier layer, comprising exposing the substrate surface to a copper solution containing complexed copper ions and having a pH value of less than 7, wherein the complexed copper ions are derived from a copper source selected from the group consisting of copper citrate, copper borate, copper tartrate, copper oxalate, derivatives thereof, and combinations thereof, applying an electrical bias across the substrate surface and reducing the

complexed copper ions with the electrical bias to deposit the copper seed layer onto the barrier layer, as recited in claim 1, and claims 2-7 dependent thereon.

Also, *Miura*, alone or in combination, does not teach, show or suggest a method for depositing a metal seed layer onto a barrier layer on a substrate surface, comprising exposing a substrate to a complexed copper solution containing complexed copper ions derived from a copper source selected from the group consisting of copper citrate, copper borate, copper tartrate, copper oxalate, derivatives thereof and combinations thereof, and reducing the complexed copper ions with an electroplating technique to form a copper seed layer, as recited in claim 11, and claims 13-15 and 17-19 dependent thereon.

Also, *Miura*, alone or in combination, does not teach, show or suggest a method for electroplating a copper seed layer comprising exposing a substrate containing a barrier layer to a copper solution containing complexed copper ions derived from a copper source selected from the group consisting of copper citrate, copper borate, copper tartrate, copper oxalate, derivatives thereof, and combinations thereof, and reducing the complexed copper ions with an electrical bias to form the copper seed layer, as recited in claim 23, and claims 24-28 and 30 dependent thereon.

Withdrawal of the rejection is respectfully requested.

Claims 8-10, 20-22 and 31-33 stand rejected under 35 USC § 103(a) as being unpatentable over *Miura* as applied to claims 1-7, 11-19 and 23-30 in view of *Dubin*, et al., US Patent No. 6,432,821 (herein *Dubin*), and in further view of *Nagai*, et al., US Patent No. 6,709,563 (herein *Nagai*). The Examiner asserts the invention would have been obvious to one having ordinary skill in the art at the time of the invention to have modified *Miura* in view of *Dubin* and *Nagai*. The Examiner applies *Miura* to describe an electrolytic copper plating solution that contains a copper salt and a complexing agent. The Examiner states that *Miura* does not teach processes to deposit copper gap-fill layers from a second copper solution and *Miura* does not teach processes to deposit copper bulk-fill layers from a third copper solution. The Examiner asserts *Dubin* teaches forcing a first forward current, a second forward current and a third forward current to deposit an initiation layer, a feature fill layer and a bulk layer. The Examiner

asserts *Nagai* teaches a highly acidic plating solution containing free-copper ions. The Applicant respectively traverses the rejection.

Miura has been discussed and distinguished above. Although *Dubin* discloses forcing a first forward current, a second forward current and a third forward current to deposit an initiation layer, a feature fill layer and a bulk layer, *Dubin* describes conducting the deposition process, including sequential reverse current steps, within one solution. *Dubin* maintains the same chemical components throughout the various steps. *Nagai* discloses electrolytic processes for copper that contain basic complexed solutions “with a pH range of 7-14, preferably at a pH of about 9” (column 16, lines 28-29).

Miura, *Dubin* and *Nagai*, alone or in combination, do not teach, show or suggest a method for depositing a copper seed layer onto a substrate surface containing a barrier layer, comprising exposing the substrate surface to a copper solution containing complexed copper ions and having a pH value of less than 7, wherein the complexed copper ions are derived from a copper source selected from the group consisting of copper citrate, copper borate, copper tartrate, copper oxalate, derivatives thereof, and combinations thereof, applying an electrical bias across the substrate surface and reducing the complexed copper ions with the electrical bias to deposit the copper seed layer onto the barrier layer, as recited in claim 1, and claims 8-10 dependent thereon.

Also, *Miura*, *Dubin* and *Nagai*, alone or in combination, do not teach, show or suggest a method for depositing a metal seed layer onto a barrier layer on a substrate surface, comprising exposing a substrate to a complexed copper solution containing complexed copper ions derived from a copper source selected from the group consisting of copper citrate, copper borate, copper tartrate, copper oxalate, derivatives thereof, and combinations thereof, and reducing the complexed copper ions with an electroplating technique to form a copper seed layer, as recited in claim 11, and claims 20-22 dependent thereon.

Also, *Miura*, *Dubin* and *Nagai*, alone or in combination, do not teach, show or suggest a method for electroplating a copper seed layer comprising exposing a substrate containing a barrier layer to a copper solution containing complexed copper ions derived from a copper source selected from the group consisting of copper citrate,

copper borate, copper tartrate, copper oxalate, derivatives thereof and combinations thereof, and reducing the complexed copper ions with an electrical bias to form the copper seed layer, as recited in claim 23, and claims 31-33 dependent thereon.

Withdrawal of the rejection is respectfully requested.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show or suggest the invention as claimed.

Having addressed all issues set out in the office action, the Applicant respectfully submits that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



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